

THAT WHICH IS CLAIMED:

1. A chemically resistant radiation attenuation composite barrier fabric comprising at least one chemical barrier layer and at least one radiation attenuation layer, wherein the composite fabric has at least 8 hours resistance to the military chemical agents distilled mustard (HD), Sarin (GB), Soman (GD), Lewisite (L), and Nerve Agent (Vx), and the composite further passes ASTM F1671.

2. The composite fabric of Claim 1 which also exhibits a permeation efficiency greater than 25% when exposed to the 15 liquid chemicals included on ASTM F1001.

3. The composite fabric of Claim 1 which further exhibits an attenuation factor of at least 50% of a primary 100kVp x-ray beam.

4. The composite fabric of Claim 1, wherein said at least one chemical barrier layer comprises a multiple layered coextruded film including at least one barrier selected from the group consisting of polyvinyl chloride, chlorinated polyethylene, chlorinated butyl, polyethylene, high density polyethylene, low density polyethylene, linear low density polyethylene, polypropylene, polyurethane, PTFE, ethylene-vinyl acetate, ethylene vinyl alcohol, polyvinyl alcohol, nylon, ionomers, polyester, polyvinylidene chloride, liquid crystal polymers, metallized films, or blends or combinations thereof.

5. The composite fabric of Claim 4, wherein the radiation attenuation layer is a mixture of a polymer matrix and a radiation attenuant filler.

6. The composite fabric of Claim 5, wherein the radiation attenuant filler comprises barium, barium sulfate or barium salts.

7. The composite fabric of Claim 6, wherein the attenuant filled polymer matrix is selected from the group consisting of polyolefins, polyethylene, polypropylene, thermal polyolefins, thermal polyolefin elastomer, vinyl polymers, polyvinyl acetate, vinyl acetate copolymers, acrylic polymers, polymethylmethacrylate, thermoset polymers,

silicones, urethane polymers, elastomeric compounds, styrene-butadiene rubber, styrene-isoprene rubber, polybutadiene, polyisoprene, butyl rubber, epoxy polymers, polyvinyl alcohol, natural latex, ethylene vinyl acetate, polyester, and blends thereof.

8. The composite fabric of Claim 1, wherein the permeation efficiency of the composite is greater than 50% when exposed to the chemicals included on ASTM F1001.

9. The composite fabric of Claim 8, wherein the permeation efficiency is greater than 75% when exposed to the chemicals included on ASTM F1001.

10. The composite fabric of Claim 8, wherein the permeation efficiency is 100% when exposed to the chemicals included on ASTM F1001.

11. The composite fabric of Claim 1, wherein at least one of the exterior surfaces of the composite fabric is heat-sealable.

12. The composite fabric of Claim 1 including an additional reinforcing layer adhered to said at least one chemical barrier layer or to said at least one radiation attenuation layer.

13. The composite fabric of Claim 12, wherein the additional reinforcing layer is of woven, knitted, or nonwoven construction.

14. The composite fabric of Claim 13, where in the additional reinforcing layer is adhered to the composite fabric by solvent or aqueous based adhesive lamination, thermal lamination, extrusion lamination, powder bond adhesive lamination, ultrasonic lamination, flame lamination, calendering, or pressure sensitive adhesive lamination.

15. The composite fabric of Claim 12, wherein the additional reinforcing layer is selected from the group consisting of polyethylene, polypropylene, nylon, polyester, rayon, acetate, cotton, wool, polyurethane, polyvinyl chloride, bicomponent fibers, meta-aramide, para-aramide, novaloid, and/or blends thereof.

16. The composite fabric of Claim 14 that further comprises a bactericidal, viracidal, and/or sporecidal surface treatment and/or polymer additive.

17. The composite fabric of Claim 14 that further comprises an organophosphate hydrolase enzyme and/or oxidizing polymer thus rendering the composite reactive to phosphorous-based and oxidizable chemicals such as military chemical warfare agents.

18. The composite fabric of Claim 6, wherein the polymer matrix is flame resistant or retardant.

19. A chemically resistant radiation attenuation composite barrier fabric comprising a first ply having radiation attenuation properties and comprising a mixture of a polymer matrix and a radiation attenuant, and a second ply having chemical barrier properties and comprising a sheet material including at least two polymer layers of different composition.

20. The composite fabric according to Claim 19, wherein said second ply comprises a multiple-layered coextruded film which includes outer heat sealable layers defining opposite outer surfaces of the second ply and an interior core layer of a polymer having chemical barrier properties.

21. The composite fabric according to Claim 19, wherein said second ply comprises a sheet material including at least one chemically resistant polymer selected from the group consisting of polyvinyl chloride, chlorinated polyethylene, chlorinated butyl, polyethylene, high density polyethylene, low density polyethylene, linear low density polyethylene, polypropylene, polyurethane, PTFE, and combinations thereof.

22. The composite fabric according to Claim 19, additionally including a reinforcing ply comprising a woven, nonwoven or knitted fabric.

23. The composite fabric according to Claim 19, wherein said first and second plies are bonded to one another by an adhesive.

24. The composite fabric according to Claim 19, wherein said first and second plies are bonded to one another by thermal lamination.

25. The composite fabric according to Claim 19, additionally including an EMF shielding ply.

26. The composite fabric according to Claim 25 wherein the EMF shielding ply is selected from the group consisting of metallized films and metallized fabrics.

27. A chemically resistant radiation attenuation composite barrier fabric comprising a radiation attenuation layer comprising a spunbond polypropylene supporting substrate, a film formed of a thermoplastic polyolefin matrix containing 40-80% by weight barium sulfate covering one surface of the spunbond polypropylene supporting substrate, and a knit fabric layer adhered to said film, and a chemical barrier layer adhered to a surface of the spunbond polypropylene supporting substrate, said chemical barrier layer comprising a coextruded barrier film having polyolefin outer layers and a polyvinylidene chloride interior layer.

28. The composite fabric of Claim 27 wherein said film has a thickness of .5 mil to 30 mil, and said spunbond polypropylene supporting substrate has a basis weight of 0.25 to 4.0 ounce per square yard.

29. The composite fabric of Claim 27 wherein said knit fabric is a knitted polyester fabric and is adhered to said film by a solvent-based polyurethane adhesive.

30. The composite fabric of Claim 27 wherein said chemical barrier layer is thermally laminated to the spunbond surface of said radiation attenuation layer.

31. A protective garment comprising the composite fabric of Claim 27.

32. The protective garment of Claim 31 which includes seams, and a seam tape covering the seams, and wherein the seam tape is formed from a chemically resistant radiation attenuation composite barrier fabric, comprising a first ply having radiation attenuation properties and comprising a mixture of a polymer matrix and a radiation attenuant, and a second ply having chemical barrier properties.

33. An article of manufacture fabricated from the composite fabric of Claim 27 in the form of a protective shelter, patient wrap, or human remains bag.

34. A method of making a chemically resistant radiation attenuation composite barrier fabric, comprising laminating a first ply having radiation attenuation properties and comprising a mixture of a polymer matrix and a radiation attenuant, to a second ply having chemical barrier properties.

35. The method of Claim 34, wherein said second ply comprises a sheet material including at least two polymer layers of different composition.

36. The method of Claim 34, including the step of laminating the first and second ply on opposite sides of a reinforcing ply comprising a woven, nonwoven or knitted fabric.

37. The method of Claim 34 wherein the laminating step comprises laminating the plies to one another with an adhesive.

38. A method for protecting against a chemical and radiological hazard which comprises defining a predetermined space to be protected, and forming a sealed enclosure around the predetermined space with the use of a chemically resistant radiation attenuation barrier composite fabric as defined in claim 1.

39. The method of Claim 38, wherein the step of forming a sealed enclosure comprises donning a protective garment fabricated from said chemically resistant radiation attenuation barrier composite fabric.

40. The method of Claim 38, wherein the step of forming a sealed enclosure comprises fabricating a protective shelter from said chemically resistant radiation attenuation barrier composite fabric.